Society 5.0

Big Data, the Internet of Things, and robotic and augmented realities are just some of the technologies that belong to Industry 4.0. These technologies improve working conditions and increase productivity and the quality of industry production. However, they can also improve life and society as a whole. A new perspective is oriented towards social well-being and it is called Society 5.0. Industry 4.0 supports the transition to the new society, but other drivers are also needed.

1. Introduction

In early 2019, the Japanese government introduced the concept of Society 5.0. Japan is one of the nations with the greatest amount of technological development applied to social wellness. For this reason, it aspires to create an anthropocentric society that strongly integrates cyberspace and physical space in order to balance economic and technological progress with social problem-solving [1][2].

The Japanese concept of Society 5.0 is aimed at the economy and at the citizens, thus promoting the idea of a Smart Society, where information technology will outline the profile of a new superintelligent company [3]. The digital transformation will once again radically change many aspects of society, affecting private life, public administration, industrial structure, and employment [4][5]. The goal is to create a society in which anyone can create value, anytime and anywhere [6], in compliance with future sustainable strategies developed with the 17 United Nations objectives [7]. Therefore, the objectives of Society 5.0 are also the objectives of the 2030 Agenda for Sustainable Development [8][9], adopted by all the member states of the United Nations in 2015. Society 5.0 will help achieve the Sustainable Development Goals. The two reforms in the vision of a new world share a common direction. From this perspective, Industry 4.0 can be considered as a tool to promote sustainable innovation and is, therefore, a policy-driven discourse on innovation [10][11][12][13][14][15][16].

2. The Industry 4.0 and Society 5.0 Relationship

Industry 4.0 (I4.0) has recently become a relevant phenomenon and is one of the most important international topics in both industry and academia today [17][18][19]. I4.0 can be understood as the combination of physical and digital technologies, such as artificial intelligence (AI) [13][20][21], cloud computing [22][23], Big Data [21][24], adaptive robotics [13], augmented and virtual realities [25], additive manufacturing [26], and the Internet of Things (IoT) [27][28].

I4.0 is considered a universal tool for the transformation of the information society that responds to the real needs of populations through the sharing of knowledge and information [1]. I4.0 can disseminate the technological initiatives surveyed in the productive environment in the social sphere [29]. The application of the results obtained from smart manufacturing creates the basis for a new model of social composition, expanding the advantage of the digital space (cyberspace) to nonproductive segments [1]. This is the case of Society 5.0. In the information society, people access a cloud service (such as a database) in cyberspace via the Internet, and search, retriev, and analyze information or data.

In Society 5.0, a huge amount of information from sensors in physical space is accumulated in cyberspace. In cyberspace, Big Data is analyzed by artificial intelligence (AI), and the results of the analysis are returned to humans in physical space in various forms. In this way, Society 5.0 transmits to humanity the next step in the development of civilization [1].

3. Factors for the Transition to Society 5.0

An essential step in the direction of Society 5.0 is the social dialogue, the exploitation of technologies, and participation at all levels of society. Society 5.0 is a socially and environmentally sustainable society. Products and services supported by governance and stakeholders that meet sustainability requirements have greater credibility and are more likely to be recognized by society. This also provides a good environment for transversal communication. This type of communication allows greater involvement in the processes needed for sustainable innovation. Technological capabilities and the sharing of information and knowledge with stakeholders are essential for the implementation of sustainable development strategies. Therefore, it is necessary to build an incentive scheme to motivate all stakeholders. In this context, technology plays a key role in industry. The best prevention and quality measures for products and services can be implemented. The impacts of technology can also be found in the quality of life of the citizen. The digital space is one of the crucial topics of interest in research in the fields of intelligent transport, intelligent manufacturing, and medical care. Healthcare is one of the objectives of Society 5.0, which strongly depends on all the other factors. The ways in which citizens can interact with technology reflect the role that citizens may have in the future within society.

4. Framework of I4.0 Technologies Implementation in Society 5.0

This new model of society is based on I4.0 technology, which is embedded in infrastructure with intelligent processes.

The integration of technological infrastructures within Society 5.0 revolves around connections and data processing in order to create a relationship between users, Big Data, robotics, sensors, and personalized services, thanks to the use of Internet technology. Everything connected to the Internet features advanced technologies that identify accurate data from the physical space, facilitate the compilation of appropriate data in real time, and send this data to cyberspace. The information collected by multiple sensors is sent to central processing units, where it is integrated and stored in data management platforms. The development of a network of various sensors allows the automatic compilation of environmental data in order to exchange data with other organizations or within the same organization. Information is closely linked to Big Data. Big Data are the set of techniques that can be used to compile and process large amounts of data and conduct their immediate analysis through data analysis. Analysis for monitoring and information acquisition is applied to the data entered and managed through Big Data. This generates additional value related to Society 5.0. Data analysis is very important in robotics. Robotics can assist humans in performing various tasks, ranging from normal housework to industrial operations. In industry, robots create an intelligent working environment in which products can orient themselves. However, the output generated by robotics must always be under human direction. Important solutions, such as AR and VR, are key parts of the components, including maintenance, service, quality assurance, self-learning, and training. Perfectly implemented, AR/VR solutions are the key solutions in the digital production field. AR plays a key role in enabling workers to access information available electronically and connect it to the physical space.

These technologies are also aimed at personally oriented services, including healthcare. In particular, the technology transferred to the citizen represents an excellent opportunity to help transform data so that it is more useful to citizens. Robots in healthcare facilities are capable of supporting people's independence. The connection and sharing of data information between users through the mobile Internet puts into practice remote medical assistance services. Through the mobile Internet, citizens can monitor data in real time. In general, data can be measured and managed, so that the healthy life expectancy can be extended.

Therefore, the technology in Society 5.0 does not establish its operations in individual sectors, as it crosses multiple fields and impacts different social models.

5. Relationship Framework between the Factors for The Success of Society 5.0

In general, the gap between I4.0 and Society 5.0 can be bridged and must be based on a joint activity of governance and technology, through intelligent solutions.

Society 5.0 is based on the requirement of active participation in social issues, with equal opportunities for all people, and an integration of innovative technologies and society, with a view to sustainable development. The integration between digital space and physical space in the social ecosystem concerns industries and governance.

In industry, technology plays a key role. Specifically, robotics and data analysis create an environment, with the use of technologies in I4.0, and offer the opportunity to also develop the skills of stakeholders. The evolution and innovative improvements of I4.0 have developed an increase in the data requirements for real-time analysis and processing.

Through the involvement of stakeholders, the strengthening of data processing technologies has made it possible to improve all the activities carried out to achieve the objectives of sustainable development. Examples of such technologies include the sensor-based information industry, data analytics, and mobile Internet applications, which allow for the real-time monitoring of activities and the use of a computer interface for human–computer interaction. The practical implementation of I4.0 technologies connects smart manufacturing with smart data processing through communication and connection technologies.

The sustainable development of Industry 4.0 also creates an environment for the development of knowledge management strategies that take place through data processing technologies.

As for the governance ecosystem, institutions play a key role in pushing technology. In fact, in light of the results, governance and technology occupy the same level of driving power. This means that decisionmakers shape conversations with industry sectors and with stakeholders. The intensity of the way they shape discourse varies according to the type of policy in place. An international policy will guide national and local policies.

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